**Step 1: Prepare for Field Work**

1. Research, supplies & equipment – research the disease or situation and gather needed

supplies & equipment to conduct the investigation

2. Administrative arrangements – make official administrative and personal travel

arrangements

3. Local contacts - follow protocol and contact all parties to determine roles & local contacts

**Step 2: Establish the Existence of an Outbreak – consider severity, potential for spread, public**

**concern, and availability of resources**

1. Expected # of cases for area – use records as health dept., hospital records, death records,

physician records, doctor survey to determine expected # for the area in a given time

2. Other factors in play – numbers may exceed normal due to factors such as better

reporting, seasonal fluctuations, population changes

**Step 3: Verify the Diagnosis**

1. Proper diagnosis- verify the procedures used to diagnose the problem and check methods

used for identifying infectious and toxic chemical agents

2. Not lab error – be sure that the increase number of cases are not due to experimental error

3. Commonality – interview several persons who became ill to gain insight concerning

possible cause, source, and spread of disease or problem

**Step 4: Define and Identify Cases – case definition and line listing**

1. Case definition – establish with the 4 components or standard criteria for determining

who has the disease or condition

a. Clinical information – about the disease or condition

b. Characteristics- of the affected people

c. Location or place- as specific as possible as restaurant, county, or several specific areas

d. Time sequence- specific time during which the outbreak or condition occurred

2. Identification of specific cases – kind & number – count specific cases

a. Confirmed – have diagnosis with case definition plus lab verification

b. Probable – many factors point to diagnosis but may lack lab verification

c. Possible – some factors point to diagnosis

Note: Initial reports may be only a small sampling of the total problem. Be sure to

expand search to determine the true size and extent of the problem.

3. Line Listing – chart of specific cases including information about each case

a. Identifying information- ID or case # - left column + name or initials

b. Clinical information – diagnosis, symptoms, lab results, hospital – death?

c. Descriptive: time – date & time of onset + date of report

d. Descriptive: person – age, sex, occupation, other characteristics

e. Descriptive: place – street, city or county + specific site

f. Risk factors & possible causes – specific to situation (disease) and outbreak setting

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***Sample Line Listing*** from six case report forms on a wedding reception outbreak

ID # Initials Date

Onset

Diagnosis How

onfirmed

Age Sex County Physician ClevelandcKay

edding

1 KR 7/23 probable trichinosis Not done 29 M Columbia Goodman Yes

2 DM 7/27 trichinosis Biopsy 33 M Columbia Baker Yes

3 JG 8/14 probable trichinosis Not done 26 M Columbia Gibbs Yes

4 RD 7/25 trichinosis Serologia 45 M King Webster Yes

5 NT 8/4 trichinosis Not done 27 F Columbia Stanley Yes

6 AM 8/11 R/Otrichinosis Pending 54 F Clayton Mason Yes

**Step 5: Describe and Orient the Data in Terms of Time, Place and Person – Descriptive**

**Epidemiology**

1. Time, Place and Person – describes disease or health situation

**TIME** - Epidemic Curve or Epi curve (Begin early & update often) – a histogram showing

the course of the disease or outbreak to identify the source of the exposure

(x axis=units of time equal to 1/4 to 1/3 incubation time and y axis = # of cases)

Note: a single point or source will have only one peak, a plateau will show a

continuous common source, several uniform peaks will indicate a propagated outbreak

spread from person to person

**PLACE** – geographic extent plus spot map of cases to identify groups specific to a location

or environmental factors

**PERSON**–identify the affected population by type of person or by exposures as age, sex,

high risk exposure as with AIDS

**Sample EPI or Epidemic Curve**

2. Types of Descriptive Studies – Study the distribution of a problem by cases or

outcome, frequency in population, exposure, time pattern or environmental

factor (Studies without a control group can be used for descriptive purposes!)

a. Case report/case series – case report = detail report of a single patient from

one or more doctors while case series = characteristics of several patients

b. Correlative studies – correlates general characteristics of the population with

health problem frequency with several groups during the same period of time

Time series analysis – correlate within the same population at different

point in time

Ecologic relations – correlate relative to specific ecologic factors as diet

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c. Cross sectional - a survey of a population where participants are selected

irrespective of exposure or disease status

**Step 6: Develop Hypotheses (Agent/host/environment triad) = chain of transmission**

1. Agent /host /environment = agent capable of causing disease & its source +

host or persons susceptible to agent + environment allowing them to get together

**Infectious Groups:** viruses, bacteria, protistans (protozoa), fungi, animals **(**worms)

2. Testable – hypothesis must be in a form that is testable

3. Current knowledge & background – it should be based upon current knowledge

and be updated or modified as new information is uncovered!!!

**Step 7: Evaluate Hypotheses – Analytical studies \*\* Must have a control group\*\***

1. Compare with established fact – these are used when evidence is strong and clear cut

2. Observational Studies: (Study determinants of health problems – how & why)

a. **Cohort** – Based upon ***exposure status*** whether or not they have outcome (illness);

used with a small well-defined population and moves forward from exposure.

Both groups have a known exposure and are checked for future outcomes or illness.

retrospective:(historic cohort) starts at exposure in past & moves forward to outcome

prospective: starts a present exposure and moves forward in time to outcome

***(Calculations = attack rate and relative risk)***

***Sample using 2 X 2 table***: 400 people attended a special awards dinner.

Some persons became ill. The suspected culprit was the potato salad.

The population at the dinner was then surveyed to determine who became ill.

***Attack rate*** – the rate that a group experienced an outcome or illness

= number sick ÷ total in that group

(Look for high attack rate in exposed & low rate in unexposed)

exposed = a ÷ (a+b) = 150 ÷ 180 = 80%

unexposed = c ÷ (c + d) = 50 ÷ 220 = 20%

***Relative risk*** = [a ÷ (a+b)] / [c ÷ (c+d)] = 80% ÷ 20% = 4

1. Relative risk estimates the extent of the association between an exposure and a disease. It

estimates the likelihood of developing the disease in the exposed group as compared to the

unexposed group.

2. A relative risk = 1.0 indicates that the incidence rates of disease in the exposed group is equal

to the incidence rates in unexposed group. Therefore the data does not provide evidence for

an association.

3. A relative risk >1.0 indicates a positive association or an increased risk. This risk increases in

strength as the magnitude of the relative risk increases.

4. The data indicates a negative association or decreased risk (possible protective effect) if the

relative risk is between 0 and 1.0. Relative risk is not expressed in negative numbers.

b. **Case-Control** - Works ***backward from effect or illness*** to suspected

cause. Control group is a selected group who has similar characteristics

to the sick group but is not ill. They are then checked for similar

exposures. It is often hard to select the control group for this type of study.

***Odds Ratio*** is calculated to evaluate the possible agents & vehicles of transmission.

**Disease Yes Disease No**

**Exposed (Ate salad)** 150 **(a)** 30 **(b)**

**Unexposed (no salad)** 50 **(c)** 170 **(d)**

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***Odds Ratio*** = Odds of exposure in cases = a/c = ad

Odds of exposure in controls b/d bc

**a** = # of case patients exposed **b** = # of control exposed

**c** = # of case patients unexposed **d** = # of control unexposed

***Sample***: Several patients were diagnosed with Hepatitis A. The

local Restaurant A was thought to be the source of the infection.

40 case patients and a similar disease free group or control were

contacted to determine if they **ate** at Restaurant A.

***2 X 2 table of data***:

**Case patients Controls Total**

**Yes a =** 30 **b =** 36 66

**No c =** 10 **d =** 70 86

**Total** 40 106 146

The odds ratio for Restaurant A is thus 30 × 70 / 36 × 10 = 5.8. This means that people who ate at

Restaurant A were 5.8 times more likely to develop hepatitis A than were people who did not eat there.

**Step 8: Refine Hypotheses and Carry Out Additional Studie**s

1. No confirmation of hypothesis - where analytical studies do not confirm hypothesis

May need to look for a new vehicle or mode of transmission

2. More specific – May need to be more specific in make up of case patients & controls

3. Verify with environmental/laboratory studies - verification with very control

conditions is very important.

**Step 9: Implement Control and Prevention Measures – as soon as possible!!**

1. As soon as source is known – people are sick or hurting and need help;

must know agent & source of agent + susceptibility of host+ chain of transmission

2. Aim at chain of agent-source-host – break the chain of transmission at any of its 3 points

3. May interrupt transmission or exposure – with vehicles as isolation

4. May reduce susceptibility – with immunization, legal issues and/or education

**Step 10: Communicate Findings (see \*\*\* on page 6 for conclusion criteria)**

1. Oral briefing – inform local health officials or other need-to-know groups

as soon as information is available

2. Written report – usually done in scientific format for future reference, legal

issues, and education

**\*\*\*Criteria to Draw Conclusions about Cause and Effect Relations:**

1. Temporality – cause/exposure must precede effect/outcome

2. Consistency – observation of association must be repeatable in different populations at different

times

3. Coherence, 1-1 relationship – exposure is always associated with outcome/ outcome is always

caused by the specific exposure

4. Strength of association – relationship is clear and risk estimate is high

5. Biological plausibility – biological explanation makes sense

6. Dose/response (biologic gradient) – increasing risk is associated with

increasing exposure